MOBIUS LOOPS TEACHER NOTES

These notes for teachers accompany the PDF slides.

Equipment needed:

- One strip of paper per Mobius loop – A4 paper can make four strips when cut lengthways into quarters.
- Sellotape/sticky tape (or glue)
- Scissors
- Colouring pens or pencils

SLIDE 1

Tell the students:
Get a strip of sellotape ready.
Take a strip of paper.
Loop the strip around as if making a normal loop, but just before you join the ends together, turn over one end of the piece of paper.
Then put sellotape along the join to hold the mobius loop together.



SLIDE 2

Tell students to: *Start drawing a line in the centre of the mobius loop and keep going until you get back to where you started.*

Students will find they need to turn the Mobius over whilst drawing – it can be a bit fiddly.

Students should notice that they have drawn on both sides of the piece of paper. Tell students that, for this reason, mathematicians actually say the Mobius loop only has one side.

The ‘fact’ about the test for a Mobius loop might be useful in a later activity, so is worth remembering…

SLIDE 3

Students should notice that they have **coloured close to 'both edges'** without trying to!

Mobius only has one edge: Tell students that, for this reason, mathematicians actually say the Mobius loop only has one edge. A normal loop has two edges - the top circle and the bottom one. But when we make a Mobius loop, the two edges get combined into one long edge. This happens when we put the 180 degree twist in – what was edge 1 gets matches up with what was edge 2, and visa versa.

In the show, Zoe cut the Mobius loop along the middle scissor line and we ended up with just one big twisty loop. Ask students if they can use this fact about the Mobius having one edge to explain why we got this result in the show.

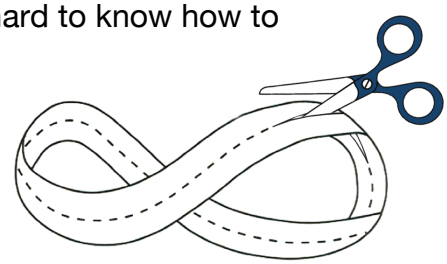
One explanation: Because there is only one edge, when you cut down the middle, there are not two edges to separate from each other (as happens with a normal loop).

When you cut down the middle you turn the single Mobius edge into one edge of the newer, (non Mobius) longer loop. The loop you end up with is twice the length of the original Mobius loop you started with.

Having done this thinking might help students 'see' what is going on when they cut down the middle for themselves (slide 4).

SLIDE 4

Tell students: *make a little fold in the mobius loop, then put a small cut into the fold, and then get your scissors into the cut and continue cutting along the scissor line.*
Without this instruction some students find it hard to know how to start cutting along the line.



Students will find they need to turn the Mobius over whilst cutting – it can be a bit fiddly.

Students should get the one big twisty loop, as they saw in the show.

They may tell you it's a mobius loop that they've ended up with it. Is it not!

You could ask students to test if it is a Mobius loop (or just another type of twisty loop), by using the Mobius loop test.

(Some students might also be inclined to cut what they've ended up with down the middle itself, to see what happens. They should get two inter-locking loops!)

The slides from here are 'extra activities' and may be too much for some students.

SLIDE 5 – as slide 1.

SLIDE 6

Same as scissor line in slide 2, but this time it goes a third of the way in from the edge.

SLIDE 7

Students predict what happens if we cut down the 'one-third' line they just drew (it gives a different result from cutting down the middle).

SLIDE 8

Repeat the 'how to start cutting' instructions from before.

Students should find they've made two loops that are interlinking.

You could ask students to test if they are Mobius loops (using the test). They should find one is, and the other is not.

You can explain this result by linking it to the 'cutting down the middle' result.

The non-Mobius loop we have created is just like our result when we cut down the middle, but it is thinner this time because we were cutting closer to the edge.

And the Mobius we have created is the middle third of the original Mobius loop that didn't get cut away, and remains as it was.

SLIDE 9 and 10 - SUPER CHALLENGE

This activity gives a lovely result, but it's very fiddly (sometimes even for adults!), so proceed with caution…try it yourself first! It's very important that one loop is twisted anti-clockwise, and the other is twisted clockwise.

Good luck!